Année psychologique (vol. xiii., p. 143) a review of the history of the mysterious *n*-rays from the time when their discovery was first announced by M. Blondlot in 1903. A complete bibliography of the subject is appended which comprises in all 176 original papers, very unequally distributed as regards date, nineteen being published in 1903, 139 in 1904 (103 in the first half of the year), seven in 1905, and fifteen in 1906. After the surprising statement had been made that it was possible to chloroform metals, and thus by a process of anæsthesia, destroy their power of emitting the rays, and largely in consequence of Prof. R. W. Wood's letter in NATURE (vol. lxx., p. 530) throwing doubt on the existence of the rays, the *Revue scientifique* instituted an inquiry to ascertain whether other physicists who had worked on the subject had succeeded in verifying the remarkable statements made by MM. Blondlot, Charpentier, and Jean Becquerel. This inquiry, which has been briefly referred to in NATURE (vol. lxxi., pp. 113, 132, 157), showed that practically all those who had attempted to establish even the existence of the *n*-rays had entirely failed. A simple method of settling the question once and for all was then proposed by the *Revue scientifique*. A number of wooden boxes of exactly the same size and appearance were to be sealed up after enclosing in some of them small pieces of lead, in others rods of tempered steel, the latter being one of the recognised sources of the rays. It was to be left to M. Blondlot or his assistants to ascertain by experiments, made in presence of a committee of witnesses, which of the boxes contained the active material. This crucial test was, however, declined by M. Blondlot, who stated that "the phenomena were far too delicate for such a trial," and left "everyone to form his own opinion on the *n*-rays either from his own experiments or from his confidence in those of others." The subject was thus withdrawn from the region of fact and transferred to that of opinion. It is significant that from this time forward publication of further experiments practically ceased. A few attempts were made to obtain photographically objective evidence of the existence of the rays, but these did not withstand the test of criticism. It appears now established that the *n*-rays and their wonderful effects had no real existence, but that the results published in so long a series of papers were due to illusion caused by a species of auto-suggestion based on preconceived ideas. The matter forms, indeed, one of the most curious chapters, not only in the history of physical science, but also in that of psychology.

PAGES 1–78 of vol. ix. of the Proceedings of the Washington Academy of Sciences contain a very useful compilation, by Mr. James W. McBain, of all the experimental data referring to the quantitative measurement of electrolytic migration. Abstracts are given of all papers bearing on the subject between the years 1814 and 1905, the numerical results being summarised in the form of tables. In the introduction a brief discussion is given of the probable degree of accuracy of the determinations, of the errors introduced by the use of diaphragms and by the methods of calculation adopted; the interpretation of the results is also dealt with, a number of anomalous cases which are not in accord with the prevalent theory of solutions being considered separately, as well as the questions of hydrated and complex ions. The matter is arranged chronologically, but for convenience of reference indexes of substances and authors are appended. The compilation appears to be very complete, and its value is enhanced by the fact that a very large number of the papers bearing on the subject have titles which give no indication that they contain experiments on electrolytic migration.

MESSRS. J. GRIFFIN AND SONS, LTD., have sent us a specimen of their new Bunsen burner, which they call an "Improved Teclu Burner." The Bunsen, as a matter of fact, is a slightly modified Marshall burner, the chief feature of which was that the air passes up from beneath the burner instead of being drawn in at the sides of the tube. The gas, on the other hand, passes in at the side, and not up the centre. The novelty in the burner is the arrangement for regulating the air supply, which is cone-shaped. We have tested the burner, and find it gives a good non-luminous flame, and can be turned extremely low without striking back. Even when at its lowest the flame is quite non-luminous.

THE new session of the Institution of Mechanical Engineers will be opened on Friday evening, October 18, when a paper on the indicated power and mechanical efficiency of the gas-engine, by Prof. B. Hopkinson, will be read.

OUR ASTRONOMICAL COLUMN.

NEW ELEMENTS AND EPHEMERIS FOR COMET 1907*d*.—The following set of elements has been calculated for comet 1907*d* by Herr Kritzinger, from observations made on June 15, July 20, and August 28:—

T = 1907 September 3·9792 M.T. Berlin.
ω = 294° 21′ 37″
Ω = 143° 2′ 03″ } 1907·0.
i = 8° 58′ 6·1″
log q = 9·709663.

This appears in No. 4201 of the *Astronomische Nachrichten* (p. 15, September 20), and is followed by a daily ephemeris computed therefrom by Herr Spohn; the following extract gives the calculated positions and magnitude for every eighth day:—

Ephemeris 12h. (M.T. Berlin).

1907	α 1907·0 h. m.	δ 1907·0 ° ′	log r	log Δ	Magnitude
Oct. 3	11 38·5	+3 17·9	9·9265	0·2458	6·9
11	12 6·9	+1 6·3	9·9908	0·2776	7·4
19	12 31·7	−0 49·9	0·0472	0·3051	7·8
27	12 53·6	−2 30·8	0·0967	0·3290	8·1
Nov. 4	13 13·2	−3 58·9	0·1399	0·3492	8·5

The magnitudes are derived from the magnitude at the time of discovery, which is taken as 8·0.

An ephemeris extending to December 30 is given by Herr J. Franz in No. 4200 of the *Astronomische Nachrichten* (p. 401, September 12).

An excellent reproduction of Mr. Plaskett's photograph, obtained at Ottawa on July 20, appears as the frontispiece to the current issue of the Journal of the Royal Astronomical Society of Canada (vol. i., No. 4).

SEPTEMBER METEORS.—A magnificent bolide was observed at South Kensington by Mr. F. E. Baxandall at 10.40 p.m. on September 19. Its path lay from near Saturn, where it first appeared, to a little south of Cassiopeiæ, where it was seen to explode and divide into two well-defined portions. The object was intensely brilliant, and travelled very slowly along its path of nearly seventy degrees.

THE ELECTRIC ACTION OF THE SUN AND OF THE MOON.—The results of some experiments on the electric action of the sun and moon, carried out by Dr. Nodon on the summit of the Pic du Midi, appear in No. 12 (September 16, p. 521) of the *Comptes rendus*, and are exceedingly interesting. Using an aluminium-leaf electrometer, so insulated that a charge of 1500 volts was retained for a week, Dr. Nodon found that the sun induced a positive charge, which varied considerably from one moment to another between one and six volts per minute. This charge was completely absorbed by clouds passing before the solar disc, but showed itself when a black card coated with paraffin was interposed between the sun and

the instrument. An earth-connected metal screen absorbed the charge.

Dr. Nodon's experiments also indicated that the potential of the soil depends upon the variable electrical state of the upper layers of the atmosphere, for when the indicated potential of the solar charge received remained constant, that of the soil was also constant, but with a varying solar potential the terrestrial potential varied several hundred volts per minute, attaining its maximum when the former ceased to manifest itself. This action is much less marked at sea-level than at the altitude of the summit of the Pic du Midi. It is suggested that the rapid variations of the terrestrial potential may indicate approaching tempests, storms, and even earthquakes, and actual observations by Dr. Nodon tend to confirm this. With this method improved, prognostications of atmospheric and seismic troubles may become possible. On August 21, between 8 p.m. and 10 p.m., Dr. Nodon also detected a positive induction produced by the full moon analogous to the solar charge, and varying from one to five volts per minute.

PERTH CATALOGUE OF STANDARD STARS.—In "A Catalogue of 420 Standard Stars, mostly between 21° and 41° South Declination, for the Equinox 1905·0, from Observations made at the Perth Observatory, Western Australia," Mr. W. Ernest Cooke, the Government astronomer of Western Australia, appears to have done an excellent piece of work, though one might wish that the details had been given somewhat more fully.

When some of the South American observatories failed to fulfil their engagements with reference to the International Photographic Chart of the Heavens, the gap was to some extent bridged by the Perth Observatory undertaking to observe the zone 32°–40° S. The catalogue plates for this zone are now practically complete, but the measurement of the star images and the necessary reductions are delayed by the want of a sufficient number of known stars to furnish the plate constants. For this reason it is proposed to observe some 10,000 stars, appropriately scattered throughout the zone, and for reasons which are not explained the method of absolute determinations has been abandoned in favour of zonal observations. Unfortunately, Auwers's catalogue, which has been accepted as the basis of the system, does not contain a sufficient number of standard stars, and it has been necessary to choose others to act as secondary standards, and to observe these repeatedly. The present catalogue gives the places of 420 stars, which will be adopted as fundamental in the zone reductions.

The number of observations of each star is usually ten, and, judged by the probable error of a single observation, the accuracy of the mean result should be sufficient for the purpose.

VIENNA MEETING OF THE IRON AND STEEL INSTITUTE.

THE autumn meeting of the Iron and Steel Institute was held in Vienna on September 23 and 24, under the presidency of Sir Hugh Bell, and was largely attended, there being about 450 members present. The proceedings opened with addresses of welcome by the chairman of the reception committee, by the Minister of Agriculture and Mines as representative of the Austrian Government, by the Mayor of Vienna, and by the president of the Austrian Society of Engineers and Architects, in the building of which the meeting was held. The addresses of welcome, which were delivered in German, having been translated by the secretary, Mr. Bennett H. Brough, the president, Sir Hugh Bell, responded in an eloquent German speech, and incidentally announced that the Archduke Frederick of Austria, who had acted as patron of the reception committee, had accepted honorary membership of the institute. The technical business then began.

Mr. W. Kestranek read the first paper. It recorded the progress made in the Austrian iron industry during the twenty-five years that have elapsed since the institute last met in Vienna. In 1882 Austria-Hungary produced 600,000 tons of pig iron, and the annual output has now risen to 1,900,000 tons. The country suffers from a scarcity of coking coal. It has nevertheless been able to maintain its position among the iron-producing countries of the world.

In the second paper read, Prof. H. Bauerman described the Erzberg of Eisenerz, the largest of the series of mineral deposits associated with the Palæozoic rocks of the eastern Alps. The raw ore averages 38·73 per cent. of iron, and the calcined ore 50·68 per cent. The ore is obtained by quarrying, the entire face of the deposit being laid out in a series of steps or terraces, fifty-eight in all, varying in height from 33 feet to 43 feet, giving a total depth of working faces of about 2000 feet. The present annual output is about 1,600,000 tons. The mining of iron ore on the Erzberg has been carried on from very early times. Traditionally, the workings date back to the eighth century, but there are no authentic records older than A.D. 931.

A paper on steel and meteoric iron was read by Prof. F. Berwerth (Vienna). The paper was prepared by way of introduction to the meteorite collection of the Imperial Natural History Museum, where opportunities are afforded for the study of meteoritic iron masses under conditions unequalled elsewhere. Meteoritic falls from 615 different localities are represented in the collection by 2075 specimens, the total weight of which is $3\frac{1}{2}$ tons. Of these, 232 falls are iron meteorites, weighing together more than $2\frac{1}{2}$ tons. The author's descriptions show that meteoritic iron and steelworks' steels are results of essentially similar chemical and physical causes.

Prof. J. von Ehrenwerth (Leoben) read a useful paper on the determination of the total quantity of blast-furnace gas for a given make of pig iron. The method proposed should prove of great value in view of the increasing importance of the waste gases as an economic factor in iron smelting, more particularly since their successful application in driving gas-engines makes it necessary that closer control should be exercised in their disposal.

At the present time there is a constantly increasing number of cases in which industrial practice is profiting by the application of the laws of modern physical chemistry. Some examples of conclusions dealing with the metallurgy of iron which may be arrived at in this way were given in a lengthy paper contributed by Baron H. von Jüptner (Vienna). He dealt more particularly with the laws of chemical equilibrium as applied to metallurgical chemical processes.

In a paper read before the institute last May, Mr. C. E. Stromeyer (Manchester) mentioned several failures of steel plates and structures, which appeared to indicate that certain qualities of mild steel might have the property of changing their nature with age. In a supplementary paper he gave the results of further experiments. They have not revealed a test which will discriminate between trustworthy and treacherous qualities of steel, but they have nevertheless established the fact that mild steel does possess ageing properties, and that certain practices which are still fairly common amongst engineers are not free from dangerous possibilities.

Four papers were read on the subject of hardening steel. Mr. C. O. Bannister (London) and Mr. W. J. Lambert (Woolwich) dealt with the case-hardening of mild steel, giving the results of some observations on the microstructure of cemented bars, on the depth of hardness, and on the carbon contents. The results do not throw much light on the manner in which the carbon penetrates the metal, but the authors consider that the solid solution theory is capable of offering a satisfactory explanation. Mr. G. Shaw Scott (Birmingham) also contributed a paper on case-hardening. He considered that nitrogen in some form is necessary for the practical performance of case-hardening, and suggested that ammonia, whilst being the prime agent in any change, may lead to the formation of cyanogen, which acts as a carrier of carbon to the metal to be carburised. Nitrogen, he concluded, should be added to the list of elements which cause iron to take or retain the γ form; and since γ iron combines more readily with carbon than does α iron, the action of nitrogen on the iron would appear to be sufficient to explain its beneficial effect during the early stages of the process of case-hardening. Throughout the research burnt leather, which is in general use in trade circles in England, was employed as the standard case-hardening material.